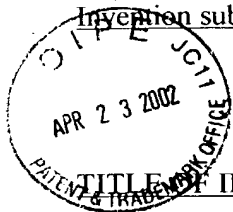Applicant: Ralph Leonard   Originally submitted 1-17-02, Today's date:4-11-02.

Invention submitted for application: Selection Of Optimal Medication Methodology (SOOMM)

SPECIFICATION

TITLE OF INVENTION

Selection Of Optimal Medication Methodology (SOOMM)

CROSS-REFERENCE TO RELATED APPLICATIONS

To the best of our knowledge, there are no prior patents which describe the process which we are submitting for application. However, a number of patents do mention in some context the problem which we are addressing, in varying levels of detail. Those patents are listed in the following table.

Patent number	Date of patent	First Author	Title
H958	8-6-1991	DeVita, Jr	PDQ cancer treatment information system
3,946,503	3-30-1976	Buchan; Robert R. C.	Audio-visual apparatus and method of using the apparatus for obtaining computer compatible data from an individual
4370983	2-1-1983	Lichtenstein ; Eric S.	Computer-control medical care system
4,839,822	6-13-1989	Dormond, Kenneth	Computer system and method for suggesting treatments for physical trauma
4,895,518	1-23-1990	Arnold	Computerized diagnostic reasoning evaluation system
4,899,758	2-13-1990	Finkelstein	Method and apparatus for monitoring and diagnosing hypertension and congestive heart failure
5054493	10-8-1991	Cohn, Jay N.	Method for diagnosing, monitoring and treating hypertension
5072383	12-19-1991	Brimm, John E.	Medical information system with automatic updating of task list in response to entering orders and charting interventions on associated forms
5077666	12-31-1991	Brimm, John E.	Medical information system with automatic updating of task list in response to charting interventions on task list window into an associated form

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5,835,900	11-10-1998	Fagg, III; Fred D	Computer-implemented decision management system with dynamically generated questions and answer choices
5935060	8-10-1999	Iliff; Edwin C	Computerized medical diagnostic and treatment advice system including list based processing
5,960,419	9-28-1999	Fagg, III; Fred D	Authoring tool for computer implemented decision management system
5,961,332	10-5-1999	Joao; Raymond Anthony	Apparatus for processing psychological data and method of use thereof
5963931	10-5-1999	Fagg, Fred D.	Computer-assisted decision management system
5987784	11-2-1999	Fagg, Fred D.	Computer-implemented decision management system with dynamically generated questions and answer choices
5993386	11-30-1999	Ericsson; Arthur Dale	Computer assisted method for the diagnosis and treatment of illness
6009420	12-28-1999	Fagg, Fred D.	Computer-implemented decision management system with dynamically generated questions and answer choices
6047259	4-4-2000	Campbell, Scott Douglas	Interactive method and system for managing physical exams, diagnosis and treatment protocols in a health care practice
6063028	3-20-1998	Luciano, Joanne Sylvia	Automated treatment selection method
6081786	6-27-2000	Barry, David W.	Systems, methods and computer program products for guiding the selection of therapeutic treatment regimens
6,112,750	9-5-2000	Chandra	Method and system for assessing risks and prognoses of a given course of medical treatment
6,188,988	2-13-2001	Barry, David W.	Systems, methods and computer program products for guiding the selection of therapeutic treatment regimens
6,208,974	3-27-01	Campbell	Method and system for managing wellness plans for a

			medical care practice
6260035	7-10-2001	Horvitz, Eric	Intelligent user assistance facility for a software program
6269339	12-29-1998	Silver, Charles	System and method for developing and selecting a customized wellness plan

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

There were no direct or indirect federally sponsored research money or support given for the development of this application or idea.

REFERENCE TO A MICROFICHE APPENDIX

Does not apply

BACKGROUND OF THE INVENTION

Definitions: For the purposes of the rest of this application, we will use the following terms as defined here. 1) *Therapeutic Class*: A group of therapies (which may be pharmaceutical or non-pharmaceutical therapies) with similar therapeutic benefits and hazards (called indications and contraindications, respectively) such that they are considered homogenous and can be used interchangeably under many circumstances. A therapeutic class can contain one or more medications. While the Food and Drug Administration (FDA) is the predominant government body that defines members of a medication class in the US, for the purposes of this program any source may be chosen by the program implementer to define members of a class. 2) *Medical Condition* – The presence of a diagnosed disease state, laboratory test abnormality, or physical exam abnormality; the latter two may not necessarily be diagnosis but rather physical finding abnormalities.

When choosing a therapy for a given patient (for simplicity, from here onwards we will assume the therapy is a medication), the physician must consider the various risks and benefits of the available medication classes and then the specific medications within the class. Risks and benefits are more formally called "contraindications" and "indications", respectively. This process, though seemingly intuitive, can become remarkably complex because each contraindication and indication may be graded as relative (low) or absolute (high) thus there can be different weights in comparing each choice.

Furthermore, the number of choices of both medication classes and the medications within those classes are growing at a rate that makes such a consideration of all the choices nearly impossible for a human or automated machine (such as a computer) to do without a formal approach.

National authorities have published guidelines which attempt to simplify this process and employ an algorithm approach. The approach, while lending itself easily to comprehension by humans and software design by programmers, captures only the major decision elements in choosing a medication and may be of little or no help in deciding among many seemingly equal choices.

Unfortunately, because patients so often have many co-morbid medical conditions, there is a staggering number of combinations of medication indications and contraindications for each patient such that any system (such as a nueral network or inference engine) that attempts to include all relevant possibilities is overwhelmed. For example, if there were only 100 relevant diseases and a given patient could only have 4 diseases, there would be 3.9 million possible disease combinations (irrespective of sequence); this is a large list of specific entities to account for yet without analyzing each one it is difficult to be sure the best medications would be chosen. In reality there are thousands of diseases and patients commonly have over a dozen, thus the possibilities become astronomical and can not be preconceived and ranked. Even if there were a way to identify and attribute best scores for each combination, the time needed to maintain the database would be prohibitive and even fast computers would take unacceptably long delays to identify the correct answer.

Furthermore, hierarchical systems which assign greater weights to some decisions (usually earliest ones) oversimplify and distort the problem such that incorrect weight is given to some aspects and the final preference ranking is not correct.

BRIEF SUMMARY OF THE INVENTION

This invention is a process that can be used manually by humans or automated with computer software to systematically deduce the optimal medications for a given patient based on all known indications and contraindications. In addition, it can incorporate preferences among medication classes as determined by the guideline publishing authority for a given disease. Finally, because it does not involve complex

decision trees, modifications can be incorporated in the process without extensive revisions of the algorithm which can greatly simplify and expedite programming updates

The process addresses the many indications and contraindications systematically by using a matrix for each medication class, and depending upon the patients co-morbidities, s/he will be best described by one or more cells in the matrix, then assigned the numeric value of that cell (in the case of fulfilling more than one cell, the value assigned for that medication class is the lowest cell value). As described in greater detail below, this is simplified if one assumes that a higher cell value represents a high benefit and no risk. Once this process has been repeated for all potentially eligible medication classes, one can then select the medication class to which the patient's represented cell value is greatest, or depending upon external rules from an algorithm, choose from among intermediate valued cell classes which may have essentially equal values.

To do this process manually is not practical, especially in the setting of a busy clinic practice. However, because it is the summation of many true/false computations, it lends itself very naturally to automated computation and is suited to software designed to help clinicians make complex decisions quickly.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING
Does not apply.

DETAILED DESCRIPTION OF THE INVENTION
In this section we will illustrate the concept with a theoretical example and will divide the process into two steps.

For the purposes of this discussion, a matrix will be defined as a table with four columns (vertical) orthogonal to four rows (horizontal) that comprise sixteen cells.

Step 1: Find the best medication class.
The first assumption is that all medications may impart both a benefit and a harm (almost always true) and that the extent of the benefit and harm is largely due to the concomitant diseases of the given

patient. We use the terms "indications" and "contraindications" to denote the benefit and harm in a

patient with a given disease.

The second assumption is that both the indications and contraindications may be categorized into three

levels: none, moderate and high. One can then get a composite score of how the multiple pro and contra

considerations balance regarding a given medication class for a patient with a set of various diseases.

This is done by using a simple 4x4 cell matrix where indications and contraindications are along the

axes, as in Figure A.

Figure A: Composite scores for a medication class in a patients with relevant diseases.

No contraindication			<u>Best score</u>
Moderate (relative) contraindication.			
Absolute (high) contraindication.	<u>Worst score</u>		
	No indication	Moderate (relative) indication	High (strong) indication.

If one assumes that a mild contraindication and a mild indication are equal, then the 9 ordinal values

assigned to the matrix may fall as follows in Figure B.

Figure B: Score assignment if one assumes both axes bear equal weight.

No contraindication.	5	8	<u>Best score=9</u>
Moderate (relative) contraindication.	2	5	8
Absolute (high) contraindication.	<u>Worst score=1</u>	2	5
	No indication	Moderate (relative) indication	High (strong) indication.

However, most practicing physicians would not equate a high indication with a high contraindication; in fact, most would consider the "risks" of a high contraindication to far outweigh the "benefits" of a high indication, thus abiding by the dictum "First, do no harm." Therefore, we think a matrix as in Figure C with the following values is a more representative approach.

Figure C: Scores based on common dictum and practices of many physicians.

No contraindication.	7	8	Best score=9
Moderate (relative) contraindication.	4	5	6
Absolute (high) contraindication.	Worst score=1	2	3
	No indication	Moderate (relative) indication	High (strong) indication.

One can quantify the degree of indication and contraindication by using score for each, then plot those scores on a table such as in Figure D.

Figure D: Values assigned to contraindications (vertical) and indications (horizontal)

3= No contraindication.			
2= Moderate (relative) contraindication.			
1= Absolute (high) contraindication.			
	1= No indication	2= Moderate (relative) indication	3= High (strong) indication.

For example, if an individual has one disease which is an absolute contraindication for a medication then their Vertical Variable Score (VVS) is 1; likewise, if s/he has another indication which is a relative (moderate) indication then the Horizontal Variable Score (HVS) is 2. The Final Variable Score (FVS) is the cell which has the intersection of the HVS and the VVS; in this example the FVS would be 2. This is

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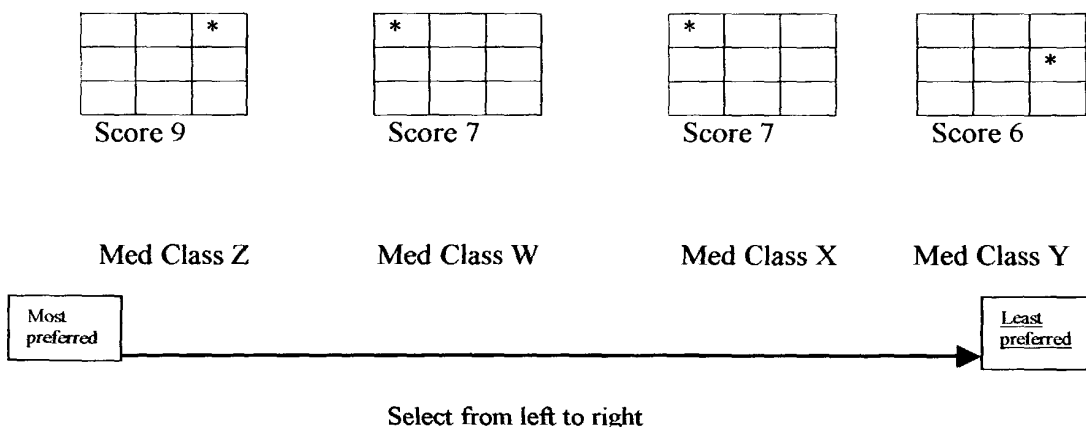Invention submitted for application: Selection Of Optimal Medication Methodology (SOOMM) analogous to defining a point in the right upper quadrant, in relation to the origin (0,0), of a Cartesian plane using positive coordinates on the ordinate and abscissa axis, respectively.

The above example illustrates how a specific cell may be located and be denoted the composite score of the indications and contraindications for that medication class. This composite medication class score is called the Final Variable Score (FVS) and may be reached for a given medication class applied to an individual patient. This process can be repeated for each possible class of medications used to treat a given disease thus arriving at several FVSs.

To pick between classes may then be based on consideration of their FVSs but also allows these classes to be presented in a preferred selection method so that the first which is equal to or greater than a given value will be chosen. This is illustrated in Figure E where we see that, although medication X has a lower score than Y, it is still preferred because of additional selection criteria that are easily applied. This is frequently the case in medicine where guidelines suggest that, all other things being equal, one medication class should be used before another (e.g., in treating hypertension one should use a diuretic before an ACE-Inhibitor).

Figure E: Arrangement of medication classes based on external guideline sorting preference, in addition to absolute values of FVC score for a guideline that states "sort such that, all other things being equal, chose W before X, X before Y and Y before Z."

Score 9   Score 7   Score 7   Score 6

Med Class Z   Med Class W   Med Class X   Med Class Y

Most preferred   Least preferred

Select from left to right

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Figure E shows that the highest score "wins", but ties may be broken by external rules such as from guidelines (thus Class W was placed ahead of Class X). However, one could also specify that if a minimum score is met (e.g., 6) then an external order is forced among those with equal or greater than those scores irrespective of the absolute values.

One can also identify a quantitative threshold below which no choice is considered safe. For example, one might say that values of 5 or less, as displayed in Figure C, require that no recommendation is offered automatically and the patient and physician must discuss the risks and benefits in greater detail.

While this process described above may seem intuitive and can be easily programmed in any computer language, the actual number of considerations is rather daunting. For example, each class of medication involves the determination of up to 9 calculations so one can assign the appropriate FVC, (e.g., each calculation could use an If-then clause to search for diseases in a patient's problem list and yield a number if it is met) thus if faced with the question of routine hypertension for where seven classes are available (ACE-I, BB, CCB, A2B, diuretics, centrally acting medication, vasodilators) , this involves 63 calculations plus the process of sorting between classes for a total of 64 computations.

For patients who have multiple indications and contraindications, their FVC could be more than one value for a given medication class. To avoid ambiguity and error on the conservative side, we use a descending order search such that the lower of more than one values will be assigned to that medication class.

Part 2: Picking a medication within a class.
Once the ideal medication class has been identified, the process of picking a given member is relatively easy since such decisions are primarily based upon arbitrary factors (mostly financial, due to negotiations between an insurance agency and a pharmaceutical company) since a class for our purposes requires internal homogeneity. The specific medication is usually selected from in ascending order of the provider's list (e.g., choose the most preferred first).

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Sample Code

The sample code here is only relevant to this process patent application. There are many other considerations in medication management (e.g., suggesting discontinuing of less favorable medication, checking for medication interactions, recommending frequency or dose adjustments of selected medications) all of which are relatively simple and beyond the scope of this process patent application.

Rather than write this code in one programming language, we have done it using "pseudocode" in the structured programming format. This allows the concepts to be more transparent and readily translated to any specific language. We are using the following assumptions of standard pseudocode language

1) A single apostrophe precedes code that explains the function of a group of code.
2) The computer processes the program from top to bottom (The place of this code is dependent upon the programming language used (e.g., for Visual Basic and many programs based on Windows, it will be triggered by an event) but that is irrelevant to the actual code content)
3) Indentations imply grouped operations which may be performed as loops or code to be executed only when the immediately preceding condition is true
4) "If, Then" operations are expressed as 'If, then' if true and an indented 'otherwise' if false.

We have inserted text in arial font such as this, to explain some of the rationale that would not normally be included in the code, even preceded by a single apostrophe. This is to aid comprehension.

For the purposes of illustration, we are using the following hypothetical medication classes and diseases as written in Tables 1 and 2. This is a gross oversimplification since there are thousands of medications and diseases. We have given these symbolic representation but also, for those familiar with some medicine, actual class names in parenthesis. The names are only to make the methods more apparent and, since the medical knowledge and truth of these tables may change, are not absolute but merely illustrative.

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Table 1

Medication class*	Specific medications in class*
A (ACE-I)	A1, A2, A3, A4, A5
B (BB)	B1, B2, B3, B4, B5
C (CCB)	C1, C2, C3, C4, C5
D (Diuretic)	D1, D2, D3, D4, D5
E (SSRI)	E1, E2, E3, E4, E5
F (B-agonist)	F1, F2, F3, F4, F5
G (warfarin)	G1, G2, G3, G4, G5

* Medication classes are designated with letters and medications within a class are designated as numbered letters. The words in parenthesis are medication class names or their acronyms.

Table 2: Key Of Disease And Class Name Abbreviations

Number	Class or Disease fully delineated
A (ACE-I)	Angiotension Converting Enzyme Inhibitor
B (BB)	Beta-blocker
C (CCB)	Calcium channel blocker
D (Diuretic)	Thiazide diuretic
E (SSRI)	Selective serotonin re-uptake inhibitor
F (B-agonist)	Beta-agnost
G (warfarin)	Generic name of a specific anti-coagulant.
1	Essential systemic hypertension
2	Left ventricular systolic dysfunction (NYH class III, in this example)
3	Proteinuria
4	Within 6 months of myocardial infarction

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5	Supraventricular tachycardia 2nd to atrial fibrillation
6	Migraine headaches
7	Non-psychotic unipolar major depression (moderate severity)
8	Non-psychotic unipolar major depression (high severity)
9	Obsessive-compulsive disorder
10	Generalized panic disorder
11	Reversible reactive airway disease (moderate severity)
12	Reversible reactive airway disease (high severity)
13	Myocardial infarction more than 6 months ago
14	Ischemic stroke
15	Atrial fibrillation in patients >65
16	Prosthetic aortic valve
17	Bilateral renal artery stenosis
18	2nd degree type 1 atrio-ventricular block
19	Hyperuricemia
20	Carcinoid tumor
21	Allergy to b-agonists
22	Idiopathic subaortic stensosis (IHSS)

* Medication Classes are designated with letter, diseases are designated with numbers and medications within a class are designated as numbered letters.

Table 3 contains some examples of indications and contraindications for medications and classes that are essential in generating appropriate scores. For medications which are grouped by the FDA in a given class but are dissimilar in indications or contraindications from other members of a class, a separate class will be generated by the programmers so its properties may be considered in detail (such as with warfarin where it is considered the sole member of its class).

Table 3

Medication class	Strong indication	Moderate indication	Strong contraindication	Moderate contraindication

A (ACE-I)	2,3,4	1	17, 22	
B (BB)	1	6, 2, 5, 18	7, 11	8, 12,
C (CCB)	5	1, 18		2
D (Diuretic)	1			19
E (SSRI)	7, 8		20	
F (B-agonist)	11			5, 21
G (warfarin)	15, 16			

For illustration, let us assume that our sample patient has diseases 1 and 22 and that this segment of the code is just concerned with treating the hypertension (disease 1)

```
` Step 1: find the final variable scores for all medication classes.
` Determine the score for every medication class
    `Determine horizontal variable score (HVS) for A, called HVS(A)
   If problem list contains diagnosis of "2", "3" or "4" then HVS(A)=3
      Otherwise,
      If problem list contains diagnosis of "1" then HVS(A)=2
         Otherwise,
         HVS(A)=1
    `Determine vertical variable score (VVS) for A, called VVS(A)
   If problem list contains diagnosis of "17" or "22" then VVS(A)=1
      Otherwise,
      VVS(A)=3
```

In the case when there is an empty set, meaning there are no diagnosis in the a respective cell (as is the case for moderate contraindications in medication class A), the If-Then and Otherwise line is dropped for that class.

```
   `Determine final variable score (FVS) for A, called FVS(A)
   If HVS(A)=3 and VVS(A)=3 then FVS(A)=9
      Otherwise,
      If HVS(A)=2 and VVS(A)=3 then FVS(A)=8
         Otherwise,
         If HVS(A)=1 and VVS(A)=3 then FVS(A)=7
         Otherwise,
            If HVS(A)=3 and VVS(A)=2 then FVS(A)=6
               Otherwise,
```

```
        If HVS(A)=2 and VVS(A)=2 then FVS(A)=5

           Otherwise,

           If HVS(A)=1 and VVS(A)=2 then FVS(A)=4

             Otherwise,

             If HVS(A)=3 and VVS(A)=1 then FVS(A)=3

               Otherwise,

               If HVS(A)=2 and VVS(A)=1 then FVS(A)=2

                 Otherwise,

                 FVS(A)=1
'Determine horizontal variable score (HVS) for B, called HVS(B)
If problem list contains diagnosis of "1" then HVS(B)=3

  Otherwise,

  If problem list contains diagnosis of "2","5","6" or "18" then HVS(B)=2

    Otherwise,

    HVS(B)=1
'Determine vertical variable score (VVS) for B, called VVS(B)
If problem list contains diagnosis of "7" or "11" then VVS(B)=1

  Otherwise,

  If problem list contains diagnosis of "8" or "12" then VVS(B)=2

    Otherwise,

    VVS(B)=3
'Determine final variable score (FVS) for B, called FVS(B)
 If HVS(B)=3 and VVS(B)=3 then FVS(B)=9

    Otherwise,

    If HVS(B)=2 and VVS(B)=3 then FVS(B)=8

       Otherwise,

       If HVS(B)=1 and VVS(B)=3 then FVS(B)=7

         Otherwise,

         If HVS(B)=3 and VVS(B)=2 then FVS(B)=6

           Otherwise,

           If HVS(B)=2 and VVS(B)=2 then FVS(B)=5

             Otherwise,

             If HVS(B)=1 and VVS(B)=2 then FVS(B)=4

               Otherwise,

               If HVS(B)=3 and VVS(B)=1 then FVS(B)=3

                 Otherwise,

                 If HVS(B)=2 and VVS(B)=1 then FVS(B)=2

                   Otherwise,
```

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```
                    FVS(B)=1
'Determine horizontal variable score (HVS) for C, called HVS(C)
If problem list contains diagnosis of "5" then HVS(C)=3
  Otherwise,
    If problem list contains diagnosis of "1" or "18" then HVS(C)=2
      Otherwise,
      HVS(C)=1
'Determine vertical variable score (VVS) for C, called VVS(C)
 If problem list contains diagnosis of "2" then VVS(C)=2
  Otherwise,
   VVS(C)=3
'Determine final variable score (FVS) for C, called FVS(C)
 If HVS(C)=3 and VVS(C)=3 then FVS(C)=9
    Otherwise,
    If HVS(C)=2 and VVS(C)=3 then FVS(C)=8
      Otherwise,
      If HVS(C)=1 and VVS(C)=3 then FVS(C)=7
        Otherwise,
        If HVS(C)=3 and VVS(C)=2 then FVS(C)=6
          Otherwise,
          If HVS(C)=2 and VVS(C)=2 then FVS(C)=5
            Otherwise,
            If HVS(C)=1 and VVS(C)=2 then FVS(C)=4
              Otherwise,
              If HVS(C)=3 and VVS(C)=1 then FVS(C)=3
                Otherwise,
                If HVS(C)=2 and VVS(C)=1 then FVS(C)=2
                  Otherwise,
                  FVS(C)=1
'Determine horizontal variable score (HVS) for D, called HVS(D)
If problem list contains diagnosis of "1" then HVS(D)=3
  Otherwise,
  HVS(D)=1
'Determine vertical variable score (VVS) for D, called VVS(D)
If problem list contains diagnosis of "19" then VVS(D)=2
  Otherwise,
  VVS(D)=3
'Determine final variable score (FVS) for D, called FVS(D)
```

```
If HVS(D)=3 and VVS(D)=3 then FVS(D)=9
   Otherwise,
   If HVS(D)=2 and VVS(D)=3 then FVS(D)=8
     Otherwise,
     If HVS(D)=1 and VVS(D)=3 then FVS(D)=7
       Otherwise,
       If HVS(D)=3 and VVS(D)=2 then FVS(D)=6
         Otherwise,
         If HVS(D)=2 and VVS(D)=2 then FVS(D)=5
           Otherwise,
           If HVS(D)=1 and VVS(D)=2 then FVS(D)=4
             Otherwise,
             If HVS(D)=3 and VVS(D)=1 then FVS(D)=3
               Otherwise,
               If HVS(D)=2 and VVS(D)=1 then FVS(D)=2
                 Otherwise,
                 FVS(D)=1
`Determine horizontal variable score (HVS) for E, called HVS(E)
  If problem list contains diagnosis of "7" or "8" then HVS(E)=3
    Otherwise,
    HVS(E)=1
`Determine vertical variable score (VVS) for E, called VVS(E)
  If problem list contains diagnosis of "20" then VVS(E)=1
    Otherwise,
    VVS(E)=3
`Determine final variable score (FVS) for E, called FVS(E)
  If HVS(E)=3 and VVS(E)=3 then FVS(E)=9
    Otherwise,
    If HVS(E)=2 and VVS(E)=3 then FVS(E)=8
      Otherwise,
      If HVS(E)=1 and VVS(E)=3 then FVS(E)=7
        Otherwise,
        If HVS(E)=3 and VVS(E)=2 then FVS(E)=6
          Otherwise,
          If HVS(E)=2 and VVS(E)=2 then FVS(E)=5
            Otherwise,
            If HVS(E)=1 and VVS(E)=2 then FVS(E)=4
              Otherwise,
```

```
                If HVS(E)=3 and VVS(E)=1 then FVS(E)=3
                    Otherwise,
                    If HVS(E)=2 and VVS(E)=1 then FVS(E)=2
                        Otherwise,
                        FVS(E)=1
'Determine horizontal variable score (HVS) for F, called HVS(F)
    If problem list contains diagnosis of "11" then HVS(F)=3
        Otherwise,
        HVS(F)=1
    'Determine vertical variable score (VVS) for F, called VVS(F)
    If problem list contains diagnosis of "5" or "21" then VVS(F)=2
        Otherwise,
        VVS(F)=3
    'Determine final variable score (FVS) for F, called FVS(F)
    If HVS(F)=3 and VVS(F)=3 then FVS(F)=9
        Otherwise,
        If HVS(F)=2 and VVS(F)=3 then FVS(F)=8
            Otherwise,
            If HVS(F)=1 and VVS(F)=3 then FVS(F)=7
                Otherwise,
                If HVS(F)=3 and VVS(F)=2 then FVS(F)=6
                    Otherwise,
                    If HVS(F)=2 and VVS(F)=2 then FVS(F)=5
                        Otherwise,
                        If HVS(F)=1 and VVS(F)=2 then FVS(F)=4
                            Otherwise,
                            If HVS(F)=3 and VVS(F)=1 then FVS(F)=3
                                Otherwise,
                                If HVS(F)=2 and VVS(F)=1 then FVS(F)=2
                                    Otherwise,
                                    FVS(F)=1
'Determine horizontal variable score (HVS) for G, called HVS(G)
    If problem list contains diagnosis of "15" or "16" then HVS(G)=3
        Otherwise,
        HVS(G)=1
    'Determine vertical variable score (VVS) for G, called VVS(G)
    VVS(G)=3 'since there are empty sets in the other categories.
    'Determine final variable score (FVS) for G, called FVS(G)
```

```
If HVS(G)=3 and VVS(G)=3 then FVS(G)=9
  Otherwise,
  If HVS(G)=2 and VVS(G)=3 then FVS(G)=8
    Otherwise,
    If HVS(G)=1 and VVS(G)=3 then FVS(G)=7
      Otherwise,
      If HVS(G)=3 and VVS(G)=2 then FVS(G)=6
        Otherwise,
        If HVS(G)=2 and VVS(G)=2 then FVS(G)=5
          Otherwise,
          If HVS(G)=1 and VVS(G)=2 then FVS(G)=4
            Otherwise,
            If HVS(G)=3 and VVS(G)=1 then FVS(G)=3
              Otherwise,
              If HVS(G)=2 and VVS(G)=1 then FVS(G)=2
                Otherwise,
                FVS(G)=1
```

For this particular patient, the scores are FVS(A)=2, FVS(B)=7, FVS(C)=7, FVS(D)=9, FVS(E)=7,FVS(F)=7, FVS(G)=7.

```
' Step 2: Now restrict the focus to just those medication classes that can be used
  to treat the disease of interest, in this case disease 1.
  If problem list does not include "1" then skip this section.
  Otherwise,
    'Sort medication classes by FVS in descending order. In the case in which the
      final variable scores for more than one medication class are equal, then sort
      the medication class scores according to assigned guideline preferences. In
      this case we are told that the preferred order for treating this disease is
      'd'>'b'>'a'='c'(i.e., 'd' is preferred to 'b', 'b' is preferred to 'a' and 'a'
      and 'c' are equally preferred).
    Do primary sort the FVS for all 8 classes in a single, descending list using
      loops.
    In the case of ties, do a secondary sort using loops such that 'd'>'b'>'a'='c'
    Let the preferred medication class (PMC) = the FVS that is first in the sorted
      order of the final (primary enhanced with secondary sort) list.
```

```
If the FVS of the PMC is <=5 then display text "there is no medication class

   which offers benefits which outweigh its risk. The computer will not suggest

   any class and defers to the preferences of the clinician and patient.'

Otherwise,

Display the text "The preferred medication class is "PMC"."

'Now choose a specific medication (SM) within the preferred class.

  Let SM= the medication name within the PMC that is first on the list germane

   to that patient's other variable constraints. In particular, each 3rd party

   payer will arrange specific medications within a class based on cost

   preferences and that order should be honored.

  Display the text "The preferred medication for this patient is "SM"."

  Display as choices in a list (e.g., a drop-down list or list-box) the

   starting, usual therapeutic and maximum doses recommended by the FDA for the

   SM when treating Hypertension.
```

For our sample patient who does have disease '1' (hypertension), the PMC is 'D' (thiazide diuretic), and depending upon her/his insurance, a specific name and dose could be listed, such as "hydrochlorathiazide 12.5 mg/day."

Subsequent code may be written for other diseases for which there is a desire to find the optimal medication and thus repeat step 2 many times.

The above code is simply one example of how this process may be expressed in a computer language. It is not to be construed as the only means and is purely illustrative. Accordingly, modifications by those skilled in the trade of computer software development, programming languages and logic symbols are possible but may be included within the scope of this invention as defined in the claims.